

Appl. No. 09/900,469
Amdt. dated February 22, 2005
Reply to Office action of November 19, 2004

Amendments to the Specification:

Please replace paragraph [0006] with the following amended paragraph:

[0006] Another type of hydrogen generation system employs a chemical hydride solution. In this system an aqueous chemical hydride solution is introduced to a catalyst bed to generate hydrogen. However, there are a number of problems associated with this liquid phase system. First, the by-product borate, in the above equation, NaBO_2 is less soluble than the reactant borohydride, namely NaBH_4 . Specifically, NaBO_2 is only approximately 20% soluble. This means that in order to generate hydrogen in a liquid phased system, and thereby reduce the problems associated with the aforementioned solid phased systems, the concentration of borohydride in the solution can only be about 20% which is much lower than borohydride's solubility in water. Therefore the achievable hydrogen density of the system is considerably limited.

Please replace paragraph [0030] with the following amended paragraph:

[0030] Preferably, the operation of continuously introducing water into the hydride tank 5 is achieved by recycling of the water entrapped in the fuel cell exhaust and supplying the water to the hydride solution. As shown in figure 1, water is generated on the cathode of the fuel cell stack 3 and is exhausted from the fuel cell stack 3 together with the unreacted air. The exhaust mixture of air and water then flows to a gas-liquid separator 16 in which air and water are separated. Therefore, the water is recovered. The recovered water is then introduced through a recovered water line 12, that provides a delivery means for the water, into the chemical hydride solution in the storage tank 5. As water is a by-product of the fuel cell reaction, the hydrogen generation system utilizes the readily available water in its vicinity, resulting in increased system efficiency. Generally, recovery of the exhaust water can enable the initial concentration of the hydride to be increased by at least 50%, as is demonstrated in the following tables.

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TABLE 1 Conventional NaBH₄ water solution

Iteration #	NaBH ₄ (g)	WT%	H ₂ O (g)	NaBO ₂ (g)	WT%
0.00	400.00	40.00%	1000.00	0.00	0.00%
1.00	350.00	36.75%	952.37	86.97	9.13%
2.00	300.00	33.16%	904.73	173.94	18.26%
3.00	250.00	29.17%	857.10	260.90	30.44%
4.00	200.00	24.71%	809.46	347.87	42.98%
5.00	150.00	19.69%	761.83	434.84	57.08%
6.00	100.00	14.00%	714.20	521.81	73.06%
7.00	50.00	7.50%	666.56	608.78	91.33%
8.00	0.00	0.00%	618.93	695.74	112.41%

TABLE 2 NaBH₄ water solution of the present invention

Iteration #	NaBH ₄ (g)	WT%	H ₂ O (g)	NaBO ₂ (g)	WT%	Recovered H ₂ O (g)
0.00	400.00	40.00%	1000.00	0.00	0.00%	0.00
1.00	350.00	33.41%	1047.63	86.97	8.30%	95.27
2.00	300.00	27.39%	1095.27	173.94	15.88%	95.27
3.00	250.00	21.87%	1142.90	260.90	22.83%	95.27
4.00	200.00	16.80%	1190.54	347.87	29.22%	95.27
5.00	150.00	12.11%	1238.17	434.84	35.12%	95.27
6.00	100.00	7.78%	1285.80	521.81	40.58%	95.27
7.00	50.00	3.75%	1333.44	608.78	45.65%	95.27
8.00	0.00	0.00%	1381.07	695.74	50.38%	95.27